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Educators' Perspectives: Learning Through Making in GenAI-Driven XR Design Using the Hackathon Method

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Abstract. This iLEAD paper examines how hackathons can support the development of educators' design competence in generative AI-supported XR environments, using a participatory design approach. Across three sessions, educators with varying backgrounds co-developed a VR bar simulation using genAI tools. The format enabled rapid skill development, tool literacy, and cross-disciplinary collaboration. Success depended on basic technical knowledge and team diversity. Beyond individual learning, the hackathons fostered a cross-institutional network for immersive learning across vocational, applied sciences, and academic education.

Keywords: XR, GenAI, Hackathon.

1 Introduction

Extended Reality (XR) technologies are rapidly gaining ground across sectors such as education, the creative industries, and healthcare. In response, educational institutions, ranging from vocational schools to universities of applied sciences and academic programs, are increasingly adapting their curricula to prepare students for emerging roles in XR design and development. This shift also highlights a pressing need for upskilling and reskilling educators, many of whom have limited prior experience with immersive technologies. Human capital is a critical concern: the future of XR depends not only on educating new makers, but also on equipping teachers to support this next generation [1].

Simultaneously, advances in generative AI (genAI), including tools for automated 3D modelling, voice generation, and real-time scripting, are reshaping what XR design entails [2, 3]. With the promise of reducing technical barriers and accelerating prototyping, these innovations may open new possibilities for educators to cultivate design competence within immersive environments. In this context, design competence is understood not as a set of discrete skills, but as the integrated ability to conceptualize, prototype, and iteratively refine learner-centered XR experiences across spatial, interactional, and technical dimensions [4]. This interpretation aligns with broader perspectives in design research, where design competence is described as the capacity to develop and adapt design solutions while navigating contextual and technical constraints [5, 6]. Nevertheless, the rapid evolution of these technologies challenges educators to keep their pedagogical approaches and technical knowledge up to date. This tension highlights the importance of sustainable, practice-oriented professional development models that enable meaningful engagement with both XR and genAI technologies.

Given that XR learning is inherently experiential [7], we contend that professional development for educators should likewise embrace experiential, hands-on formats. In this context, we explore the potential of hackathons as a collaborative platform for educators to experiment with genAI in XR design. Hackathons are time-bounded, participant-driven events where people with diverse expertise collaborate on shared projects [8]. These events are organized around specific objectives and foster an environment that encourages bold experimentation, often pushing participants beyond their usual domains of expertise [9]. Outcomes may include prototypes or other shareable artefacts.

In recent years, hackathons have been studied extensively across various purposes, such as corporate innovation, education, civic engagement, and research [9]. Educational hackathons, in particular, are conducted as part of teaching and learning activities, often initiated and guided by educators themselves [10]. This prompts the consideration of whether hackathons could similarly serve as an effective format for the professional development of educators, not only to build their own skills, but also to identify the skills their students need.

We argue that hackathons are especially suitable for this purpose due to three core characteristics [9]. First, technology is central to hackathons, which often focus on developing technological solutions. Second, they promote experimentation, encouraging participants to take risks and learn through making. Third, hackathons foster diverse, non-hierarchical teams, where participants of varying backgrounds and skill levels can contribute equally. This inclusivity makes hackathons ideal for engaging with emerging technologies like XR and genAI. However, their effectiveness depends on the availability of tools that support this collaborative, exploratory format, which is challenging since most existing genAI and XR technologies are designed for specialized commercial purposes rather than the versatile, multifunctional use required in hackathons [9].

Our central aim is to investigate in which ways the hackathon format supports the development of educators' design competence in emerging XR and genAI contexts. Thus, our research question is: In which ways does the hackathon format support the development of educators' design competence in genAI-driven XR design, regardless of prior technical expertise?

2 Method

To examine how hackathons can serve as a professional development format that supports educators in developing design competence in genAI-driven XR design, irrespective of their prior technical expertise, this study adopted a participatory design approach. Participatory design is a form of systematic inquiry conducted in direct collaboration with those affected by the issue under study [11], generating knowledge through iterative cycles of designing, making, and reflecting on artefacts and design processes [12, 13]. Accordingly, the hackathon series was designed as a sequence of co-creative working sessions in which educators actively developed XR content using genAI tools, while simultaneously reflecting on their design processes and learning experiences.

2.1 Participants

Erasmus University Rotterdam (EUR), Rotterdam University of Applied Sciences (RUAS), and Grafisch Lyceum Rotterdam (GLR) each host an XR lab. Representatives from these labs extended an invitation to colleagues within their respective institutions to participate in the hackathon sessions. In total, 20 educators participated (EUR: 5; RUAS: 7; GLR: 8). The sample was relatively diverse, including 9 women and 11 men and representing a wide age range (29–60 years). Within their educational roles, they brought diverse professional backgrounds, including software development, XR design, interaction design, creative media, and technology coordination. Prior experience with XR ranged from limited exposure to extensive professional expertise, while familiarity with genAI tools varied from none to advanced use. Several educators participated in multiple sessions, while others joined for one or two iterations, resulting in a mix of continuity and new perspectives across the three-session series.

2.2 Procedure

We organized three one-day hackathon sessions with the three institutions (October 2024; March 2025; May 2025). The sessions were set up as a relay: each iteration built on the outcomes of the previous one. All sessions centered on a shared design challenge from an ongoing research project: developing a VR bar simulation involving guest interactions. Each day started with a recap of prior outputs, a brief for the iteration, and the instruction to use genAI tools as the primary means to develop concepts and prototypes. Educators collectively unpacked the task, self-assigned roles based on expertise and interest, and worked in small subgroups on interim deliverables. Each session concluded with team presentations, which informed the focus of the next iteration (e.g., session 1: virtual bar environment; session 2: character interactions).

2.3 Data Collection

In line with practice-based design research traditions, where qualitative documentation techniques such as observation, artefacts, and structured field notes are commonly employed [12, 13], data were generated through structured field observations and plenary reflective stand-ups at the end of each hackathon session. Two coordinators documented the design process using structured field notes while facilitating the sessions, recording how educators engaged with the task, collaborated, and worked with genAI tools. Observations were guided by indicators of perceived progress in the design process. Tool use, perceived affordances and constraints, and encountered obstacles formed part of this process-oriented documentation. Each session concluded with a plenary stand-up reflection in which educators articulated key challenges, learning experiences, and overall perceptions of the day. Educators also shared notes and collaboratively produced artefacts.

2.4 Data Analysis

Field notes and documented plenary reflections were analyzed inductively. Through open coding and iterative analytic discussions, codes were clustered into higher-order categories, resulting in three overarching themes: (1) engagement with AI tools, (2) development of technical design skills, and (3) networking and collaboration. Patterns were examined across all three hackathon iterations, with cross-institutional researcher discussions used to refine interpretations.

3 Results

We structure our findings using a distinction from hackathon literature between tangible hackathon outcomes (e.g., prototypes) and intangible hackathon outcomes (e.g., learning, collaboration, mindset shifts) [4].

3.1 Tangible Hackathon Outcomes

First, tangible outcomes focused on the development of a shared VR bar environment (see Fig. 1), including several functioning prototypes: a real-time avatar generator, real-time conversational interactions with a virtual bartender powered by a language model, avatars engaging in dialogue with each other using AI-generated speech, and basic object interactions such as cleaning spills and serving drinks. A shared asset library was also created to support ongoing development. While some elements, like the avatars, were visually rough or distorted, educators embraced these imperfections as part of the creative process. Together, these components culminated in a working bar simulation environment.

Fig. 1. Experimenting in the VR bar simulator during one of the hackathon sessions.

3.2 Intangible Hackathon Outcomes

Tool Literacy. One key intangible outcome across all sessions was the development of tool literacy and adaptive strategies for engaging with genAI. Educators described the hackathon as a valuable "playground" for exploring a wide variety of tools, which helped them gain confidence in selecting and applying unfamiliar technologies. They learned how to search for relevant tools, assess their usefulness, and quickly familiarize themselves with new interfaces. This hands-on exposure was particularly valuable given the fragmented and fast-moving nature of the genAI tool landscape, where functionalities vary and tools often need to be combined to achieve desired outcomes. While some educators found tools like GitHub Copilot, especially when integrated into Unity, empowering and accessible, others encountered technical limitations. For instance, the generation and import of 3D assets for use in Unity frequently required additional skills in programs like Blender, including simplifying models to meet performance requirements. These experiences highlighted the importance of developing not only basic tool familiarity, but also broader strategies for evaluating and adapting to new technologies as they evolve.

Technical Design Skills. A second major intangible outcome related to educators' evolving understanding of the skills required to effectively use genAI in XR design. Educators reported that while initial tasks, such as creating basic VR environments using genAI, were relatively quick and successful, more complex tasks like scripting avatar interactions proved significantly more challenging and time-consuming. For example, attempts to generate interactive avatars (e.g., crying on command or responding to props) often broke down when transitioning from desktop mode to VR integration, due to bugs that required debugging skills educators did not yet possess.

Across sessions, educators noted that the more specific the design intent, the harder it became to rely on genAI. Commands like “place a lamp in the scene” were handled well, but more nuanced behaviors, such as conditional animations triggered by interaction, exceeded the current capacity of tools like GitHub Copilot. When experienced developers attempted to use AI-assisted coding for these cases, the tools frequently produced flawed or hallucinated code, sometimes compounding errors rather than resolving them. In such cases, manual coding remained more efficient.

These experiences emphasized a recurring theme: a foundational level of technical knowledge is essential to benefit meaningfully from genAI tools. Educators observed that even with highly capable models, understanding the underlying logic, terminology, and architecture of platforms like Unity was necessary to identify and resolve common issues. Without this, seemingly minor errors, such as misplacing components in a child rather than a parent object, became time-consuming obstacles. Importantly, educators did not perceive genAI as replacing digital craftsmanship but rather augmenting it. While genAI lowered initial barriers and helped newcomers reach basic outcomes more quickly, sustained progress still required expert knowledge. As one educator noted, the learning curve is steep at first, but quickly flattens unless deeper domain knowledge is developed. In this sense, genAI supports, but does not substitute, professional XR design and development.

Collaboration. A recurring theme across all sessions was the strong sense of interdependence among educators. Educators emphasized that they truly needed one another to make progress, whether to develop scenarios, create visual or audio assets, or troubleshoot technical obstacles. For instance, educators noted that when generating a 3D mesh using genAI tools, the output is rarely optimal without expert refinement. In such cases, collaboration with a 3D specialist proved invaluable, underscoring the benefits of working in multidisciplinary teams. This reliance on each other’s strengths highlighted the importance of having at least a basic understanding of XR and genAI tools in order to effectively ask for and offer support. The hackathon format proved highly valuable for the participating institutes in terms of inspiration, rapid knowledge exchange, and skills development. As a result, the institutes intend to continue applying this format collaboratively in the coming years to address a range of XR-related challenges. The format fostered an open, exploratory mindset in which educators felt encouraged to experiment beyond their own domain. Educators also reported increased awareness of XR’s practical potential, both for their own teaching and for broader educational use. Notably, the sessions led to the emergence of a cross-institutional knowledge network connecting educators from vocational, applied sciences, and academic contexts, strengthening collaboration across traditionally separated domains. At RUAS, this translates into embedding the hackathon as a recurring study day for faculty in Creative Media & Game Technologies, while at EUR, the approach is adopted to support XR partners in onboarding through hands-on experimentation. At GLR, hackathons will be used to connect immersive tech students with alumni and industry partners, embedding real-world practices into vocational education. The partners acknowledge

4 Conclusion and Discussion

This abstract examined how the hackathon format can support educators in developing XR design competence through the use of genAI. The findings indicate that such a format can facilitate the development of design competence, and enable meaningful engagement with emerging technologies, even among educators with limited prior experience in XR or genAI. Several conditions appeared to shape these outcomes.

First, a minimum level of technical familiarity, particularly with XR concepts, 3D modelling, and coding, was important. Second, diversity of expertise within hackathon teams emerged as a key enabling factor. Teams combining different disciplinary perspectives were better able to navigate technical challenges and co-create functional outcomes. Iterating on a shared design brief across multiple sessions further supported cumulative learning and deeper competence development.

The hackathon format also created opportunities for cross-institutional exchange among vocational, applied sciences, and academic educators. While the exploratory nature of the study does not allow for broad generalization, the emergence of a knowledge network among educators points toward the potential of such formats to foster sustained professional collaboration across institutional boundaries. In this sense, the hackathon configuration offers practice-based insight into how professional development initiatives focused on XR and genAI may be structured to support the human capital development of future XR professionals, at a time when the immersive technology sector faces a growing shortage of skilled talent and increasing demand for specialized competencies [14].

4.1 Practical Implications

Drawing on this multi-institutional hackathon series, we propose the following design guidelines that may inform the design of comparable GenAI-driven XR professional development initiatives in higher education.

Ensure a foundational level of technical literacy. Hackathons appear most effective when educators possess at least basic familiarity with XR engines, 3D modelling, and scripting logic. In our case, genAI tools supported development but did not substitute underlying domain expertise.

Design for iterative continuity across sessions. Working with a shared and evolving design brief across multiple sessions supported cumulative learning and deeper competence development.

Frame genAI as augmentation, not replacement. Explicitly positioning genAI as a support tool helped maintain the importance of professional XR craftsmanship while lowering entry barriers for experimentation.

Include time and space for exploratory tool literacy. Given the rapidly evolving and fragmented genAI landscape, structured experimentation helps educators develop adaptive evaluation strategies rather than tool-specific dependency.

4.2 Limitations

Although this study sheds light on the potential of hackathon-based professional development for immersive technologies, it remains exploratory and context-bound. It does not isolate causal effects of the hackathon format or genAI tools, nor does it examine long-term competence development. The findings therefore offer situated insight rather than generalizable conclusions. Future research may build on this work through longitudinal, comparative, or larger-scale designs to further assess transferability and sustained impact.

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